CLAIMS

1. A nucleic acid molecule comprising a first polynucleotide that comprises a first nucleotide sequence chosen from:

(a) SEQ ID NOS.:14 and 16-18;

(b) a polynucleotide encoding a polypeptide comprising a amino acid sequence chosen from SEQ ID NOS.:15, and 21-22;

(c) a complementary polynucleotide comprising a complementary nucleotide sequence that is complementary to the first nucleotide sequence of (a); and

(d) a biologically active fragment of any of (a) – (c); and, wherein the nucleic acid molecule is an isolated molecule.

2. The nucleic acid molecule of claim 1, wherein the nucleic acid molecule is chosen from: a cDNA molecule, a genomic DNA molecule, a cRNA molecule, a siRNA molecule, an RNAi molecule, an mRNA molecule, an anti-sense molecule, and a ribozyme.

3. The nucleic acid molecule of claim 1, further comprising its complement.

4. The nucleic acid molecule of claim 1, wherein the first nucleotide sequence is SEQ ID NO.:17.

5. The nucleic acid molecule of claim 1, wherein the first nucleotide sequence is SEQ ID NO.:18.

6. The nucleic acid molecule of either claim 4 or 5, further comprising a second polynucleotide.

7. The nucleic acid molecule of claim 6, wherein the second polynucleotide comprises a second nucleotide sequence encoding a secretory leader, and the secretory leader is a homologous or heterologous leader.

8. The nucleic acid molecule of claim 7, wherein the secretory leader is a heterologous leader.

9. The nucleic acid molecule of claim 7, wherein the secretory leader is a secretory leader chosen from SEQ ID NOS.:26-223.

10. A polypeptide comprising a first amino acid sequence, wherein the first amino acid sequence is chosen from:

(a) SEQ ID NOS.:15 and 21-22;

(b) a sequence encoded by one of SEQ ID NOS.:14 and 16-18; and

(c) an active fragment of (a) or (b); wherein the polypeptide is an isolated molecule.

11. The polypeptide of claim 10, wherein the polypeptide is present in a cell culture.

12. The polypeptide of claim 10, wherein the polypeptide is present in a cell culture medium.

13. The polypeptide of claim 11, wherein the cell culture is chosen from a bacterial cell culture, a mammalian cell culture, an insect cell culture, and a yeast cell culture.

14. The polypeptide of claim 10, wherein the polypeptide is present in a plant or a non-human animal.

15. The polypeptide of claim 10, wherein the first amino acid sequence is the amino acid sequence of SEQ ID NO.:21.

16. The polypeptide of claim 10, wherein the first amino acid sequence is the amino acid sequence of SEQ ID NO.:22.

17. The polypeptide of claim 10, wherein the polypeptide further comprises a second amino acid sequence, and the second amino acid sequence is a secretory leader, the secretory leader is a homologous leader or a heterologous leader, and wherein the first and second amino acid sequences are operably linked.

18. The polypeptide of claim 17, wherein the secretory leader sequence is a heterologous leader sequence.

19. The polypeptide of claim 18 wherein the heterologous leader sequence is chosen from SEQ ID NOS.:26-223.

20. A polypeptide comprising at least six contiguous amino acids from SEQ ID NO.:24 or encoded by SEQ ID NO.:20.

21. A vector comprising the nucleic acid molecule of claim 1 and a promoter that regulates the expression of the nucleic acid molecule.

22. The vector of claim 21, wherein the vector is a viral vector or a plasmid.

23. The vector of claim 21, wherein the vector is a pTT vector.

24. The vector of claim 21, wherein the promoter is chosen from one that is naturally contiguous to the nucleic acid molecule and one that is not naturally contiguous to the nucleic acid molecule.

25. The vector of claim 21, wherein the promoter is chosen from an inducible promoter, a conditionally-active promoter, a constitutive promoter, and a tissue-specific promoter.

26. A recombinant host cell comprising a cell and the nucleic acid of any of claim 1, 4 or 5, the polypeptide of claim 10, 15, or 16, or the vector of claim 21.

27. The host cell of claim 26, wherein the cell is a prokaryotic cell.

28. The host cell of claim 26, wherein the cell is a eukaryotic cell.

29. The host cell of claim 26, wherein the eukaryotic cell is chosen from a human cell, a non-human mammalian cell, an insect cell, a fish cell, a plant cell, and a fungal cell.

30. The host cell of claim 26, wherein the cell is a mammalian cell.

31. The host cell of claim 30, wherein the mammalian cell is a cell of a 293 cell line or a CHO cell line.

32. The host cell of claim 31, wherein the cell is a 293 cell.

33. The host cell of claim 32, wherein the 293 cell is a 293T cell or a 293E cell.

34. An animal injected with the nucleic acid molecule of claim 1 or the polypeptide of claim 10.

35. The animal of claim 34, wherein the animal is a rodent, a non-human primate, a rabbit, a dog, or a pig.

36. A nucleic acid composition comprising the nucleic acid molecule of claim 1 and a carrier.

37. A polypeptide composition comprising the polypeptide molecule of claim 10 and a carrier.

38. A vector composition comprising the vector of claim 21 and a carrier.

39. A host cell composition comprising the host cell of claim 26 and a carrier.

40. The composition of any of claims 36 – 38, wherein the carrier is a pharmaceutically acceptable carrier or excipient.

41. A host cell composition comprising a recombinant host cell comprising

a cell;

a pharmaceutically acceptable carrier or excipient; and

the nucleic acid of claim 1, the polypeptide of claim 10, and/or the vector of claim 21.

42. A method of producing a recombinant host cell comprising:

(a) providing a vector that comprises the nucleic acid molecule of claim 1; and

(b) allowing a cell to come into contact with the vector to form a recombinant host cell transfected with the nucleic acid molecule.

43. A method of producing a polypeptide comprising:

(a) providing the nucleic acid of claim 1; and

(b) expressing the nucleic acid molecule in an expression system to produce the polypeptide.

44. The method of claim 43, wherein the expression system is a cellular expression system.

45. The method of claim 44, wherein the cellular expression system is a prokaryotic or eukaryotic expression system.

46. The method of claim 43, wherein the expression system comprises a host cell transfected with the nucleic acid molecule, forming a recombinant host cell, and the method further comprises culturing the recombinant host cell to produce the polypeptide.

47. The method of claim 43, wherein the expression system is a cell-free expression system chosen from a wheat germ lysate expression system, a rabbit reticulocyte expression system, a ribosomal display, and an *E. coli* lysate expression system.

48. A polypeptide produced by the method of claim 43.

49. A polypeptide produced by the method of claim 46, wherein the host cell is chosen from a mammalian cell, an insect cell, a plant cell, a yeast cell, and a bacterial cell.

50. A method of determining the presence of an antibody specific to the polypeptide of claim 10 in a sample comprising:

(a) providing a composition comprising the polypeptide of claim 10;

(b) allowing the polypeptide to interact with the sample; and

(c) determining whether interaction has occurred between the polypeptide and the antibody.

51. The antibody of claim 50, chosen from a polyclonal antibody, a monoclonal antibody, a single chain antibody, and an active fragment of any of these.

52. The antibody of claim 51, wherein the antibody is a fragment chosen from an antigen binding fragment, an Fc fragment, a cdr fragment, a V_H fragment, a V_C fragment, and a framework fragment.

53. The polypeptide of claim 10 or a polypeptide produced by the method of any of claims 43-49, wherein the polypeptide further comprises at least one fusion partner.

54. The polypeptide of claim 53, wherein the fusion partner is chosen from a polymer, a polypeptide, a succinyl group, fetuin, leucine zipper nuclear factor erythroid derivative-2 (NFE2), neuroretinal leucine zipper, mannose motif (mbp1), tetranectin, an Fc fragment, and serum albumin.

55. A method of inhibiting tumor growth comprising:

(a) providing a composition comprising the polypeptide chosen from any one of claims 10, 15, 16, 48, and an active fragment of any of these; and

(b) contacting the tumor with the composition.

56. A method of killing tumor cells, comprising:

contacting tumor cells having a death domain receptor with a polypeptide chosen from any one of claims 10, 15-16, 48, and an active fragment of any of these.

57. The method of claim 56, wherein the tumor cells are human tumor cells.

58. The method of claim 57, wherein the tumor cells are solid tumor cells or leukemic tumor cells.

59. The method of claim 55, wherein tumor cells are chosen from a carcinoma, a mammary adenocarcinoma, and a non-small cell lung carcinoma.

60. The method of claim 57, wherein the tumor cells are a breast tumor, a colon tumor, a lung tumor, a prostate tumor, a bladder tumor, a stomach tumor, and skin cancer.

61. A method for treating of a mammary adenocarcinoma in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

62. A method for treating of a non-small cell lung carcinoma in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

63. A method for treating of a breast tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

64. A method of treating of a lung tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

65. A method of treating of a prostate tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

66. A method of treating a colon tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

67. A method of treating a stomach tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

68. A method of treating a bladder tumor in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

69. A method of treating of skin cancer in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these, and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

70. A method of treating a glioblastoma in a subject comprising:

(a) providing a composition containing a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these; and a pharmaceutically acceptable carrier; and

(b) administering the composition to the subject.

71. A pharmaceutical composition comprising:

(a) a polypeptide chosen from any of claims 10, 15-16, 48, and an active fragment of any of these;

(b) an anti-cancer agent; and

(c) a pharmaceutically acceptable carrier.

72. The pharmaceutical composition of claim 71, wherein the anti-cancer agent is chosen from a chemotherapeutic agent, a radiotherapeutic agent, an anti-angiogenic agent, and an apoptosis-inducing agent.

73. The pharmaceutical composition of claim 72, wherein the chemotherapeutic agent is chosen from a steroid, a cytokine, a cytosine arabinoside, fluorouracil, methotrexate, aminopterin, an anthracycline, mitomycin C, a vinca alkaloid, an antibiotic, demecolcine, etoposide, mithramycin, chlorambucil, and melphalan.

74. A method of treating a tumor in a subject comprising:

(a) providing a first composition comprising fragments of mature APO2L polypeptide;

(b) providing a second composition comprising an anti-cancer agent different from the polypeptide of 10; and

(c) administering the first and second compositions to the subject.

75. The method of claim 74, wherein the second composition comprises a monoclonal antibody composition or a chemotherapeutic agent or another polypeptide.

76. The method of claim 74, wherein the second composition reduces expression of Akt or survivin.

77. The method of claim 76, wherein the Akt inhibitor is SH-6.

78. The method of 76, wherein the tumor is a glioma or glioblastoma.

79. The method of claim 74, wherein the tumor is a multidrug resistant tumor.

80. The method of claim 79, wherein the multidrug resistant tumor is an osteosarcoma.

81. The method of claim 74, wherein the second composition comprises another polypeptide.

82. The method of claim 81, wherein the other polypeptide is an interferon.

83. The method of claim 82, wherein the interferon is interferon gamma.

84. The method of claim 83, wherein the tumor is Ewing's sarcoma.

85. The method of claim 74, wherein the second composition comprises a chemotherapeutic agent.

86. The method of claim 85, wherein the chemotherapeutic agent is doxorubicin, epirubicin, pirarubicin, or cisplatin.

87. The method of claim 86, wherein the tumor is prostate cancer.

88. The method of claim 74, wherein the second composition comprises an inhibitor of NF-κB.

89. The method of claim 88, wherein the inhibitor of NF-κB is N-acetyl-L-leucinyl-L-leucinyl-ILnorleucinal (LLnL).

90. The method of claim 74, wherein the fragments comprises amino acid residues 40 – 45 and 92 – 281, 92 – 281, or 114 – 281 of the full length wild type APO2L polypeptide.